

THE QUICK 'n DIRTY ON

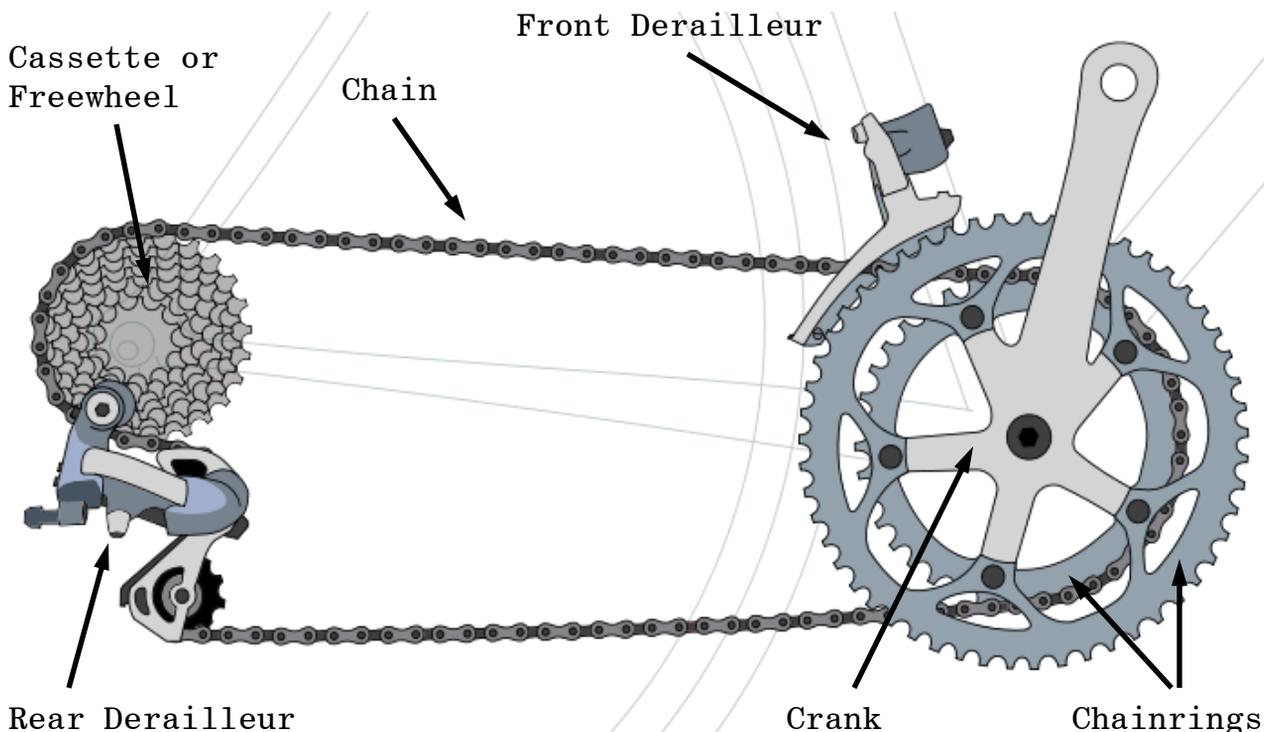
DRIVETRAIN



www.FCBikeCOOP.org

The drivetrain consists of the cranks, chainring(s), chain, and cog(s). On multispeed bikes, derailleurs, which move the chain to change gears, are also considered part of the drivetrain.

ANATOMY of the drivetrain



COMPATIBILITY Gear spacing and chain width matter!

If you fit more gears in the same amount of space (ex. a 9 speed versus an 8 speed cassette), then the distance between adjacent cogs decreases. When the distance between cogs decreases, the chain must be made narrower so that it doesn't unintentionally catch or rub against the adjacent larger cog. An 8 speed chain used on a 10 speed cassette will skip up the cassette because it's too wide. A 10 speed chain used on an 8 speed cassette will be slow to change gears because it isn't wide enough to catch the adjacent cogs. You can never successfully mismatch rear indexed shifters, derailleurs, and cassettes of different speeds.

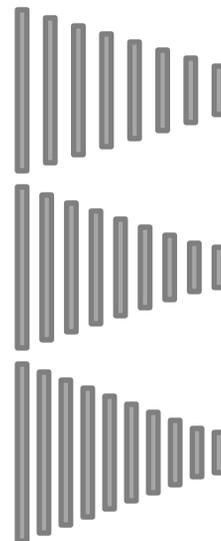
8 Speed

4.80mm
spacing

9 Speed

4.34mm
spacing

10 Speed

3.95mm
spacing

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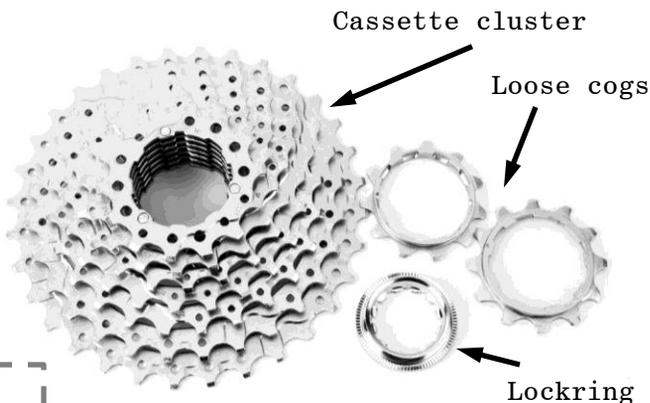


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Cassettes and freewheels offer significant potential for changing the gearing of a bike. It is best to avoid changing portions of a cassette.

CASSETTES

Cassettes come in a variety of styles. Most have at least one or two loose small cogs, but some are composed entirely of loose cogs and spacers. You can never make an X - 1 speed cassette by removing one cog from an X speed cassette. Why? The spacing between cogs doesn't change.



FREEHUB BODY

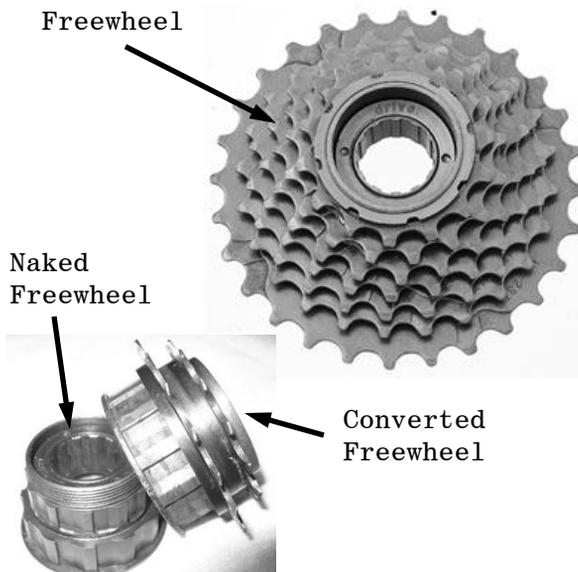


7 speed freehub bodies are shorter than 8-9-10 speed freehub bodies, so you can't fit an 8, 9, or 10 speed cassette on older 7 speed freehubs.

Cassettes wear out with use, especially with a worn chain. People who ride on the road a lot will wear out the smaller cogs first, while mountain bikers will wear out the larger cogs first. On loose cog cassettes you can replace only the worn cogs.

FREEWHEEL

Freewheels are single-piece clusters with a ratcheting system built in. On many cheap bikes, the ratcheting system and associated bearings rarely last as long as the cogs do. There are many quality freewheels (older Shimano and Suntours) that will last many years. Freewheels can be rebuilt with new cogs or turned into singlespeed freewheels. This is often much easier for a singlespeed conversion than switching to a true singlespeed freewheel, as you have lots of adjustability with the cog spacing.



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Crank arms can have different lengths, different bottom bracket interfaces, different offsets, and different spiders (what the chainrings attach to).

CRANKS

Most crank arms come in lengths between 170 and 175mm from the center of the bottom bracket interface to the center of the pedal. There are some shorter crank arms for kids (who have shorter legs) and for track use (so you don't clip a pedal). There are some oddball longer cranks.



BOTTOM BRACKET INTERFACES

Square taper is the most common in the shop, but keep an eye out for various splined patterns.

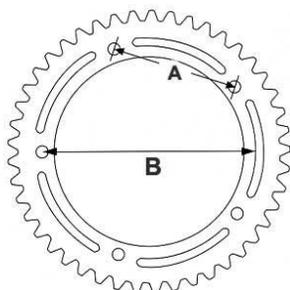


Most crank spiders have either 4 or 5 holes. The most common road cranks both have 5 holes with a bolt circle diameter (BCD) of 130mm (full) or 110mm (compact). The most common mountain cranks have 4 holes with 104mm BCD. There are other oddball sizes. Some cranks have space to mount 3 chainrings (triple) while others only accept 2 (double).

CHAINRINGS

Chainrings come in different sizes (number of teeth) and to fit cranks with different bolt circle diameters.

BOLT CIRCLE DIAMETER or BCD



A = center-center distance

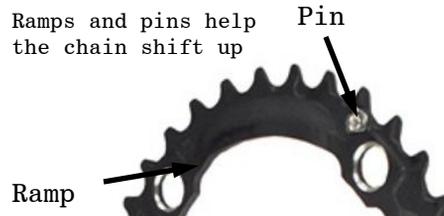
B = bolt circle diameter

BCD is hard to measure. For center-center to BCD conversions see

<http://sheldonbrown.com/harris/chainrings.html>



Ramps and pins help the chain shift up



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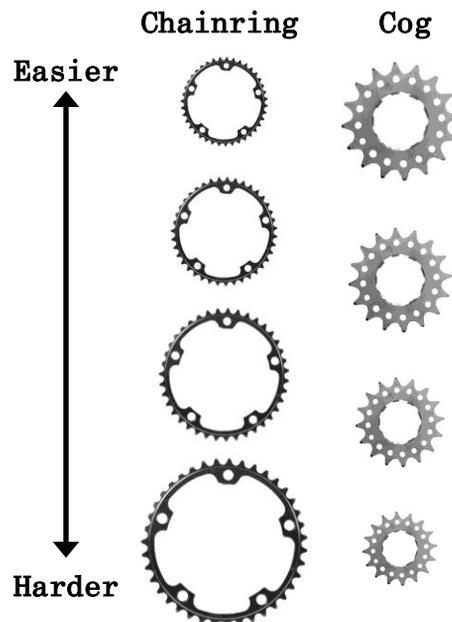
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How many gears do I need? How big should they be?

Well...the answer depends on a lot of factors: how strong the rider is, what the bike will be used for, personal preference on simplicity/maintenance/function, etc.

GEARING

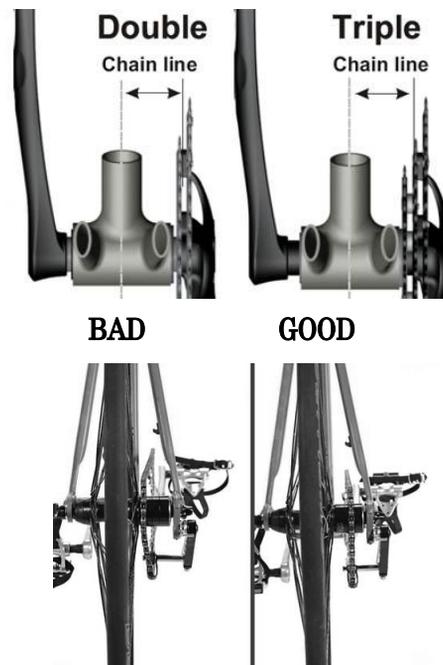
Gear selection and range can vary based on the intended use of a bike. A basic measure of gear difficulty is the ratio of the size of the chainring and cog. A higher ratio is harder to drive than a lower ratio, ex 2:1 is harder than 1:1. If you want to go really fast, like on a road bike, then you want large chainrings (39-52t) and small cogs (11-23t). For touring, lower gearing helps with the extra weight, ex 24-36-46t chainrings and an 11-30t cassette. Mountain bikes may be geared even lower, often with 22-32-42t chainrings and 11-33t cassettes. Fixed gear and singlespeed drivetrains are common in Fort Collins for commuting due to the relative flatness of the terrain and the ease of maintenance. Ask Tim for the perfect gear.



CHAINLINE

Chainline refers to the alignment of the chainring(s) and cog(s). A general rule is that chainline should be as close to straight as possible to minimize lateral forces on the chain and gears. With singlespeed and fixed gear drivetrains, chainline is very important for efficient and safe function. With multispeed bikes, the chainrings should sit close to center with the cassette. This will minimize the harmful effects of cross chaining. On a multispeed bike, most chainline adjustment happens up front by picking an appropriate combination of crank and bottom bracket. An inappropriate crank-BB combination may cause other problems such as interference with the chainstay or failure of the front derailleur to reach beyond its range.

How to measure



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Chains. There's a lot more to chains than you might think.

CHAINS

The pitch (pin to pin distance) of all modern chains is 1/2". Chain width can vary based on application, with chains broadly grouped into singlespeed chains (1/8" wide) and multispeed chains ($\leq 3/32$ "). Chains get thinner as the number of gears in the cassette increase.



Singlespeed chain (top) versus multispeed chain (bottom)

All you need to know is stamped on the chain

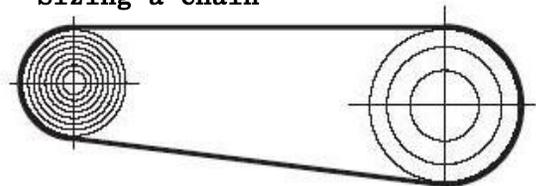


SRAM PC48 Chain

It is important to match the width of a chain to the speed of the drivetrain (# of cogs in the cassette). While it is possible to measure with calipers, it is often best and easiest to look at the chain, find the brand and model number, and then reference the internet for compatibility info.

Chain length can be determined by draping the chain over the largest chainring and the largest cog. This is the tightest the chain will ever be, but you need some slack for the rear derailleur, so add an extra two links to this length.

Sizing a chain



Big and Big + 2 links

Working with chains

Chains wear over time. Chains also can become damaged in crashes or from harsh shifting. It is generally best to replace the entire chain instead of patching together chain segments of different wear.



Check the stretch of the chain

Reconnecting Chains

1) Drive pin back in, 2) Replacement pin MUST be used on Shimano chains, and 3) quick link



Breaking the chain



Shimano chain pin



Quick link



For right now, we'll focus on the cranks, chainrings, chain, and cassette.

TROUBLESHOOTING drivetrain problems

1) Random noises

Sometimes drivetrain problems are hard to diagnose because small issues with the chain or gears will be periodic and difficult to see. Take your time and look at everything closely. Run the chain through your hand; feel for stiff or twisted links. Inspect the quick link if you have one. Take a good look at the chainrings and cogs; make sure they have all their teeth and are straight.

2) Slipping or skipping

Check the chain for wear. Replace if stretched. Inspect the leading edge of the teeth on the cogs. Slipping is most likely to occur on the smallest cogs because very few teeth engage with the chain at a given time. Replace if "shark-finned." Generally it is good practice to replace the chainrings if the cassette or freewheel is severely worn.

3) Shifting won't line up

If the chain jumps when shifting, despite efforts to adjust it, it may be the wrong chain. Check for model numbers stamped onto the side of the chain. Make sure the chain is compatible with the number of gears on the cassette. If it's the right chain, take a close look at the cassette. Make sure spacers aren't missing and that the spacing between cogs is consistent.

4) Excessive chain slap or chain drops

The chain may be too long. Remove extra links. If the chain is properly sized, inspect the rear derailleur for wear. If everything checks out, learn to ride smoother.

5) Creaking

Creaking noises are most often associated with the cranks and chainrings. Make sure the crank bolts are properly torqued. Check the chainring bolts. Tighten if loose. If creaks persist, pull the crank arms off, clean the bottom bracket spindle, re-grease, and re-assemble. The same can be done with the chainring bolts.

6) Grinding

Grinding noises can be caused by a dirty or dry chain. First clean and lube the chain. If the grinding occurs after replacing a worn chain with a new chain, this indicates that the chainrings and cassette are severely worn. The ghetto thing to do is to pick out a worn, but not severely worn chain that will mesh better with the worn drivetrain. The proper thing to do is to replace the rest of the drivetrain.

7) Chain periodically rubs on the front derailleur

One of the chainrings is bent. True the bent ring using a flat blade screwdriver or a crescent wrench, or replace the chainring.